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SUBJECT (Descriptive title. Use individual reports for separate subjects)
special requirements for telephone equipment and cable lines in case of atomic warfare
TELEPHONE EXCHANGE AND LINE EQUIPMENT IN COMMUNICATION SERVICE WITHIN A UNIT

SUMMARY (Give summary which highlights the salient factors of narrative report. Begin narrative text on AF Form 112a unless report can be fully stated on AF Form 112. List inclosures, including number of copies)

Forwarded herewith is a summary of an article entitled "Telephone Exchange and Line Equipment in Communication Service Within a Unit" (Nekotoryye soviety po oborudovaniyu telefonnykh stantsiy i liniy vnutrenney svyazi), by Col A. Vasil'yev, published in the P: Voyennyy Svyazist (Military Signalman), No. 6, 1958, pp. 23-27.

The article describes the special requirements the telephone equipment and cable lines operating under conditions of atomic warfare must meet. It can be assumed that the same requirements are applied to the Signal Communication Service of the Soviet Air Force.

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2 INCLS

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TELEPHONE EXCHANGE AND LINE EQUIPMENT IN COMMUNICATION SERVICE WITHIN A UNIT

The conduct of combat operations under conditions of atomic warfare imposes special requirements with regard to the telephone exchange equipment and to the laying out of cable lines used in communication service within a unit. The central telephone exchange should be set up in such a way that the troop control center is not unmasked, the approaches to the exchange concealed, the length of the subscribers' lines limited to the minimum and the trunk cables made easily accessible. Two-wire telephone cables are only used within the troop control center.

In order to protect the personnel and materiel against the effect of atomic explosion central telephone exchange of medium capacity must be accommodated in a dugout shelter of rigid construction, as it is shown in Fig. 1 at the end of this summary. The P - 194 switchboard, the line distributors or the stands of distributing frames and the testing and measuring instruments are disposed inside the shelter (Fig. 2). The distributing frame and the switchboard are placed and affixed to the shelter floor in such a way that the signal personnel have free access to them. When, instead of a distributing frame, the line distributors are used, they must be fixed to the shelter wall close to the cable entrance, behind the switchboard or on its side, 120 - 150 cm over the floor surface and at a distance of at least 20 cm from each other.

If the shelter walls are made from earth, the lead-in and connecting cables are separated from the wall by board pieces, rods and other available materials.

When long distance service lines are used, normal audibility is secured by an audio frequency amplifier cut in the first cord pair of the switchboard. To do this, jumper cables on the line-mounting plate of the switchboard must be removed from the terminals 1 - 2 and 3 - 4, and the input and output of the amplifier connected to them.

The switchboard must be connected to the line distributors or distributing frame stand by means of the TTVK 10 x 2 cable which has to be laid out on the floor in a wooden groove (Fig. 3), and over the walls, to which it must be affixed with wooden cleats (Fig. 4a) or metallic binding saddles (Fig. 4b) every 90 - 100 cm, as well as with binding twine (Fig. 4 v and g). If the cable is fixed with metallic saddles, the cushions of soft material must be laid between the cable and the saddles to prevent mechanical damage to the cable insulation. The protective cushion is usually wider than the saddle and embraces the cable braid from three sides. When the cleats or saddles are not available, first of all, the cables should be sewn with binding twine, to form a cluster and then must be hanged on the nails hammered into the wall. Separate TTVK cables can be also hanged on the nails by means of the knots made from the binding twine.

The lead-in and connecting cables must not be affixed to the walls by means of wire staples or bent nails, because the rubber hose of the cable is quickly damaged and the cable becomes worthless. The indoor wiring, however, made of the PTG-19, PTF-7, P-274, 5, P-275 m, and P-297 cables must be fixed with wire staples or bent nails at the points covering the cable insulation with paper or adhesive insulating tape.

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Distances of 35 - 40 cm must be kept between the staples in horizontal wiring, and 45 - 50 cm in vertical one. In addition, the cables laid out inside the telephone exchange shelter should not cross each other.

The cable entrances running into the exchange should be placed in the rear or on lateral sides of the shelter. The entrances are provided with steel or concrete tubes or wooden boxes of such a size that the cables can be led in freely into the shelter.

To prevent the products created by the atomic explosions from penetrating into the shelter, the doors to the shelter are provided with double hermetic seals, and the cable entrances protected with hermetic cork covers. The external end of the cable entrance (duct) may be located inside a well (shaft) which has to be covered with a board and then filled up with the earth.

The P-194A switchboard is connected to the entrance distributors by means of the TTVK 5 x 2 cables, four of which are extended up to a distance of 40 - 50 m, and the other four 90 - 95 m away from the shelter. If the P-194B is set up, only four cables of the said type are laid out to a distance of 50 m. Entrance distributors of the cables should be fixed to the stubs located in the wells or niches (recesses). Below the entrance distributors, the cables are tied together into braids and fixed to the stubs. The wells are covered with shields and camouflaged. Time permitting, the TTVK 5 x 2 cables must be laid out on wooden racks in the grooves, as it is shown in Fig. 5. But if the telephone lines are used in the communication service within a unit or for long lasting operation (several weeks or months), it must be done without fail. To prevent a breakdown, the cable must not be tightened up but must sag without touching the bottom of the groove. Water collecting wells and drainage are to be made inside the grooves. If a telephone exchange is set up for a few days only, the TTVKA cable should be laid in the grooves 10 - 20 m deep and filled up with earth. The grooves may be dug by means of the P - 279 light trench-digging machine mounted on the DT-14 tractor.

The lead-in cables can be also laid out in the grooves 5 - 10 cm deep dug on the bottom of the communication trenches, fire trenches, as well as in special excavations made in trench bar (uncovered) slopes. The cable is supported by pegs hammered into the earth bearing binding twine knots (Fig. 6).

Twenty lines which can be made from the cables such as the PTF-7, PTG-19, P-274, P-275, or P-297, are lead into the P-194B switchboard. They are laid out loosely, rather sagging, in the grooves 10 - 20 cm deep and are covered with earth. The joints between the cables must be insulated with the polyvinyl-chloride tape and must remain uncovered in order to avoid any contact with the ground.

The lines running to the telephone exchange and laid out by means of the PTG-19 or PTF-7 cable must be run through the communication and fire trenches, as well as through the grooves already dug for the TTVK cable.

When a telephone exchange is set up in a forest or inhabited locality, the subscriber lines must be conducted over the trees or buildings at 3 - 4 m over the ground and rest on special cross-arms or, if necessary, laid out in the grooves.

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The lines running from the radio relay stations and the stands of high frequency telephone equipment pass through the entrance, the line distributors or distributing frame, and are connected to the subscriber line equipment on the switchboard. Each distributor serves for leading-in a couple of lines and each single line is connected to the corresponding terminals (1 -a and 1-b) on the distributor board. It is expedient to use the P-271 and P-274 cables for the said connections; the attenuation of these cables is considerably lower when comparing with other types of cables.

To protect the personnel making the measurements and tests and equipment against the high voltage, ground connections must be made in every telephone exchange. The "Burav" type grounding device and easily available materials such as copper wire, galvanized-steel wire or pipes are used for that purpose.

Ground connections are usually made close to the shelters in the lower, damp layers of the earth. In some cases, when the grounding resistance becomes low, the ground must be watered with salt or acid solution.

The signals and calls of each line attached to the telephone exchange must be tested. Cable resistance (ohmic) and insulation resistance between the cables, as well as the cable and the ground, must be measured by a tester.

While picking up (selecting) the type of cable necessary for laying a telephone line, one must take into account its parameters (see table below) and bear in mind that the lower the ohmic resistance and the higher the insulation resistance, the longer will be the line which has to be laid out by the given type of cable.

The telephone exchanges of small and large capacity are approximately equipped in the same way as those of medium capacity.

Table of Field Telephone Cables Used in Communication Service Within a Unit

The type of cable	Resistance ohm/km	Insulation Resistance megohm/km
P-271 black pair	25	200
white pair	45	200
TTVK 5 x 2	65	50
TTVK 10 x 2		
PTG - 19 (single wire)	45	50
P-274	125	at least 1
PTF-7 (two wires)	150	25
P-275	460	at least 1
P-297	1100	at least 1

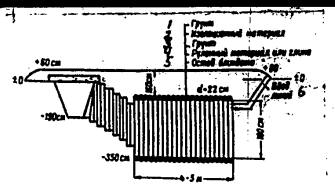

Рис. 1

Fig. 1 - Dugout shelter for the accommodation of a telephone exchange.
Legend: 1 - Earth; 2 - Insulating material; 3 - Earth; 4 - Roofing material or clay; 5 - Frame of the shelter; 6 - Entrance duct of the lines.

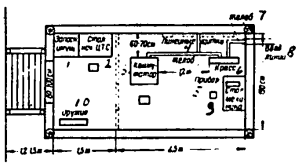

Рис. 2

Fig. 2 - Layout of the elements of the telephone exchange inside the shelter.
Legend: 1 - Spare materiel; 2 - Table of telephone exchange supervisor; 3 - Switchboard; 4 - Line distributors; 5 - Measuring instrument; 6 - Distributing frame; 7 - Groove; 8 - Line entrance; 9 - Mechanic's table; 10 - Weapon.

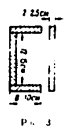

Рис. 3

Fig. 3 - Cross section of a wooden groove.

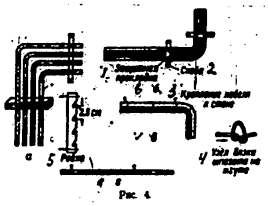

Рис. 4

Fig. 4 - Fastening of the cables to the shelter wall by means of (a) wooden cleat, (b) metallic saddles, (v and g) binder twine.
Legend: 1 - Protective material; 2 - Saddle; 3 - Fixture of the cable; 4 - Knot of binding twine around the cable braid; 5 - Rack.

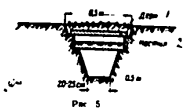

Рис. 5

Fig. 5 - Cross section of a wooden groove with wooden racks for laying out the cables.
Legend: 1 - Turf; 2 - Flooring.

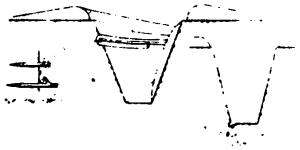

Fig. 6 - Cross sections of communication trenches with grooves for laying out the cables.
Legend: 1 - Cable fixture; 2 - Groove 5 - 10 cm deep.

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